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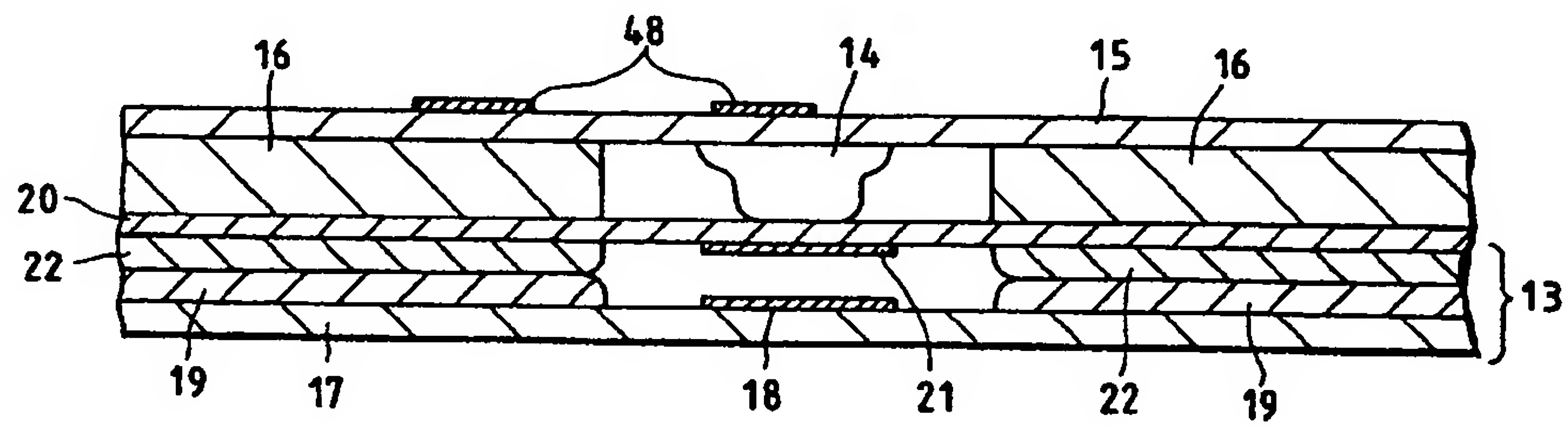
(54) **Illuminated switch unit**

(57) In an illuminated switch unit, a switch operating projection (14) is provided on the reverse surface of an EL lighting element (15) and this EL lighting element (15) is fixed above a membrane switch (13) via spacer (16), thereby removing any obstacles interrupting or intercepting illumination light emitted from EL lighting element (15).

FIG. 6



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Description

The present invention relates to an illuminated switch unit using an EL lighting element preferably applicable to input operating sections of various electronic devices.

Recent developments of micro IC drive inverters have increased the need for an EL lighting element which is thin and capable of realizing a proper surface lighting serving as a backlight for liquid crystal display units and switches of various electronic components, such as communication devices, video devices, and acoustic devices.

Hereinafter, a conventional illuminated switch unit using such an electroluminescent lighting element will be explained.

As shown in Fig. 11 an upper insulating sheet 201 made of resin film has a reverse surface on which a movable contact 202 is printed. A lower insulating sheet 203 has an upper surface on which a stationary contact 204 is printed. Spacer 205, which is resin film having both surfaces applied with adhesive, are interposed between upper insulating sheet 201 and lower insulating sheet 203 so that movable contact 202 and stationary contact 204 are disposed in a confronting relationship with a predetermined gap therebetween when these sheets 201 and 203 are fixed each other to form a membrane switch 206.

An electroluminescent lighting element (abbreviated as EL lighting element) 207 is disposed on this membrane switch 206. A top sheet 211, made of transparent resin film, is disposed and fixed on this EL lighting element 207 via spacer 212 of transparent resin film applied adhesive on both surfaces thereof. Top sheet 211 has an upper surface provided with printed pattern representing letters, figures or others 208 and a lower surface provided with a button 209 which is a transparent or semi-transparent resin product bonded by adhesive 210 to the lower surface of top sheet 211, thereby constituting the conventional illuminated switch unit.

Next, an operation of the above-described conventional illuminated switch unit will be explained. Depressing top sheet 211 causes button 209 to move downward and press or push EL lighting element 207. Hence, a region of upper insulating sheet 201 which received a depressing force through EL lighting element 207 is recessed. Movable contact 202, which constitutes part of membrane switch 206 and is provided at the lower surface of the recessed portion of upper insulating sheet 201, is depressed downward. Hence, movable contact 202 can be brought into contact with stationary contact 204 provided on lower insulating sheet 203, thereby establishing an electrical connection therebetween.

However, according to the above-described conventional arrangement, the presence of button 209 and spacer 212 causes undesirable illumination such as silhouette of these parts or irregularities of luminance. Furthermore, the manufacturing costs will be increased due to numerous parts and increased assembling processes.

Accordingly, in view of above-described problems encountered in the prior art, the present invention aims to provide an illuminated switch unit capable of improving uniformity of illumination from the EL lighting element, simple in construction, and cheap in manufacturing costs.

The present invention provides an illuminated switch unit comprising an EL lighting element having a reverse surface provided with a switch operating projection which constitutes an operating means be disposed above a push switch.

More specifically, the present invention provides an illuminated switch unit comprising: a push switch having a movable contact and a stationary contact disposed in a confronting relationship with a predetermined gap; and an electroluminescent lighting element provided above the push switch, the electroluminescent lighting element having a reverse surface provided with a push-switch operating projection for depressing the movable contact to turn on the push switch.

In the above illuminated switch unit, it is preferable that the push-switch operating projection is formed by printing insulating resin. Alternatively, the push-switch operating projection is formed by bonding a rigid member. It is further preferable that the electroluminescent lighting element is a diffusion-type electroluminescent lighting element. Furthermore, it is preferable that a surface of the electroluminescent lighting element, serving as a light-emitting surface, is provided with printed pattern representing letters, figures or others. Yet further, the push switch is an membrane switch with or without click motion. The push switch is a push switch with click motion, and the movable contact is a metallic thin plate configured in a diaphragm shape.

With this arrangement, it becomes possible to remove any obstacles interrupting or intercepting illumination light emitted from the EL lighting element. Hence, uniformity of illumination light emitted from the EL lighting element can be surely attained. Furthermore, the construction becomes simple, and the manufacturing costs can be reduced largely.

The above and other features and advantages of the present invention will become more apparent from the following detailed description of exemplary embodiments and the accompanying drawings, in which:-

Fig. 1 is a plan view showing an EL lighting element which may be used in embodiments of the present invention;
Fig. 2 is a cross-sectional view taken along a line X-Y of Fig. 1;
Fig. 3 is a perspective view showing an EL lighting element and a printed circuit board connected by anisotropic conductive adhesive which may be used in embodiments of the present invention;
Fig. 4 is a partly cross-sectional perspective view showing the arrangement of layers constituting an EL lighting element enabling the connector connection which may be used in embodiments of the present invention;

Fig. 5 is a cross-sectional view similar to Fig. 2 but showing another arrangement of an EL lighting element which may be used in embodiments of the present invention;

Fig. 6 is a cross-sectional view showing an arrangement of illuminated switch unit in accordance with a first embodiment of the present invention;

Fig. 7 is a cross-sectional view showing details of an EL lighting element of the first embodiment of the present invention;

Fig. 8 is a cross-sectional view showing an arrangement of an illuminated switch unit in accordance with a second embodiment of the present invention;

Fig. 9 is a cross-sectional view showing an arrangement of an illuminated switch unit in accordance with a third embodiment of the present invention;

Fig. 10 is a cross-sectional view showing an arrangement of an illuminated switch unit in accordance with a fourth embodiment of the present invention; and

Fig. 11 is a cross-sectional view showing an arrangement of a conventional illuminated switch unit.

Hereinafter, a first example of an EL lighting element that may be used in embodiments of the present invention will be explained with reference to Figs. 1 and 2.

An insulating transparent film 1 is a polyethylene terephthalate (abbreviated as PET, hereinafter) film of 75μm. A transparent electrode layer 2 having a dry film thickness of 3 to 5μm is pattern printed on this insulating transparent film 1 by screen printing a transparent electrode paste. This transparent electrode paste is produced by the following procedure. First, thermal-hardening insulating resin (which is formed by mixing epoxy resin #828 commercially available from Yuka Shell Co., Ltd. and phenoxy resin YP-40 commercially available from Touto Kasei Co., Ltd. at the same weight ratio and then adding imidazole block isocyanate G8009B commercially available from Daiichi Kogyo Seiyaku Co., Ltd. as hardening agent at 1.5 weight part per 100 weight part of the above mixture) is mixed with indium oxide powder (SCP-X of Sumitomo Metal Mining Co., Ltd.) of 60 weight % and then is subjected to a three-roll diffusing operation. Subsequently, solvent (isophorone) is appropriately added to adjust the viscosity of the transparent electrode paste at 13Pa. The transparent electrode paste, thus screen printed, is dried at 155°C for 15 minutes, thereby pattern forming the transparent electrode layer 2 having the dry film thickness of 3 to 5 μm.

In the same manner, the following pastes are successively accumulated on the transparent electrode layer 2 at predetermined patterns to form a multi-layer construction of light-emitting layer 3, dielectric layer 4, back-surface electrode layer 5, and insulating coat layer 6.

Light-emitting layer 3: a paste forming the light-emitting layer 3 is produced by the following procedure. A mixed solution of 50g, consisting of cyanoethyl pullulan resin of 70 weight % and cyanoethyl polyvinyl alcohol resin of 30 weight % (i.e. a solution obtained by dissolving CR-M of 30 weight % with formamide; CR-M is a product commercially available from Shinetsu Chemical Co., Ltd.) is mixed with imidazole block isocyanate (G8009B supplied by Daiichi Kogyo Seiyaku Co., Ltd.) of 2g serving as hardening agent. Then, illuminant (TYPE40 of Sylvania Corporation) of 100g is added to thus obtained mixture and is stirred and diffused therein. A dry thickness of resultant light-emitting layer 3 was 35μm.

Dielectric layer 4: a paste forming the dielectric layer 4 is produced by the following procedure. That is, vinylidene fluoride copolymer rubber solution of 53g (a solution obtained by dissolving DAIEL G902 of 35 weight % with isophorone; Daiel G902 is a commercially available product from Daikin Industry Co., Ltd.) is mixed with the hardening agent consisting of 0.02g Di-cumyl peroxide and 50g $BaTiO_3$ powder (commercially available from Kantou Chemical Co., Ltd.) by performing the three-roll diffusing operation. Thus formed paste had a dry film thickness of 35μm.

Back-surface electrode layer 5: a paste forming the back-surface electrode layer 5 is a conductive paste (DW-250H of Toyobo Co., Ltd.) A resultant film had a dry thickness of 10μm.

Insulating coat layer 6: a paste forming the insulating coat layer 6 is an insulating paste (XB-804A of Fujikura Kasei Co., Ltd.). A resultant film had a dry film thickness of 30μm.

Fig. 1 shows a plan view showing the EL lighting element produced by performing the above-described lamination printing method. Fig. 2 is a cross-sectional view taken along a line X-Y of Fig. 1. In this example, collecting electrodes 5a and 5b are integrally formed with the back-surface electrode layer 5 by performing a simultaneous pattern printing operation. When electric voltage 100V of 400Hz was applied on these collecting electrodes 5a and 5b, an initial luminance of 74.8 Cd/m^2 was obtained. Then, the 50% luminance decline period was measured by leaving the light-emitting sample of this embodiment in a tank of 70°C and a tank of 40°C/90-95% RH. As a result, the 50% luminance decline period was 300 hours in the 70°C tank, and was the 1,000 hours in the 40°C/90-95% RH tank.

The indium oxide powder serving as the conductive powder comprises needle-like powder (A) and fine-grain powder (B) blended at a predetermined weight ratio (A):(B). When the ratio of needle-like powder (A) is less than 20%, the conductivity is largely deteriorated in the lamination printing process of light-emitting layer 3 and dielectric layer 4 and also in the succeeding drying process. Hence, the luminance is lowered correspondingly. When this sample is left in an atmosphere of high temperature and high humidity, the luminance is further worsened. Furthermore, when the ratio of all the conductive powder (C) to the insulating resin (D) is not larger than 45%, the conductivity is so declined that no

light can be obtained from the EL lighting element and the dispersion of the luminance is enlarged. On the other hand, when the ratio of all the conductive powder (C) to the insulating resin (D) is not less than 95%, it becomes impossible to obtain a uniform film layer in the printing operation. Hence, the light permeability is deteriorated. The luminance will be also deteriorated, and the dispersion of the luminance will be enlarged. In view of the balance between the light permeability and the conductivity and also the stability of the conductivity under the lamination printing operation and possible environmental changes, the following is desirable ratios defined based on the experimental data.

$$(A) : (B) = 100 : 0 \text{ through } 40 : 60$$

$$(C) : (D) = 55 : 45 \text{ through } 80 : 20$$

Furthermore, it was confirmed that the similar result could be obtained by printing collecting electrodes 5a and 5b in advance before forming transparent electrode layer 2.

In a second example, the thermal-hardening insulating resin contained in the transparent electrode paste, used in the first example, was set to the same solid-state ratio. And, in the same manner as the first example, several EL lighting elements were experimentally fabricated by using various transparent electrode pastes including the following resins.

a) Photo-hardening resin: acrylate group resin (3031 of Three Bond Corporation);
b) Photo-hardening resin: acrylate group resin (UR 3000 of Mitsubishi Rayon Co., Ltd.);
c) Thermal-hardening resin: urethane modified epoxy resin of 70 weight % (EPU-6A of Asahi Denka Kogyo K.K.) is mixed with polyester resin of 30 weight % (#300 of Toyobo Co., Ltd). And then, imidazole block isocyanate (G8009B of Daiichi Kogyo Seiyaku Co., Ltd.) serving as hardening agent is added with the resultant mixture at 20 weight part per 100 weight part of the resin;
d) Thermal-hardening resin: epoxy resin of 60 weight % (#828 of Yuka Shell Co., Ltd.) is mixed with epoxy modified polyester resin of 40 weight % (EP2940 of Toyobo Co., Ltd). And then, imidazole block isocyanate (G8009B of Daiichi Kogyo Seiyaku Co., Ltd.) serving as hardening agent is added with the resultant mixture at 10 weight part per 100 weight part of the resin;
e) Comparative example: 5 weight part of oxime block isocyanate (KE1001 of Daiichi Kogyo Seiyaku Co., Ltd.) serving as hardening agent is added to 100 weight part of cyanoethyl resin (CR-M of Shin-etsu Chemical Co., Ltd.);
f) Comparative example: 3 weight part of melamine serving as hardening agent is added to 100 weight part of polyvinylidene fluoride group rubber (Daiel G201 of Daikin Industry Co., Ltd.); and
g) Comparative example: urethane modified polyester resin (UR8300 of Toyobo Co., Ltd.).

In the case of the photo-hardening resin of sample a), its film was hardened by using a UV lamp having its light-emitting wavelength of 300 to 400 nm. When electric voltage 100 V of 400 Hz is applied, a resultant initial luminance was 76.2 Cd/m^2 for sample a), 70.3 Cd/m^2 for sample b), 74.6 Cd/m^2 for sample c), and 75.6 Cd/m^2 for sample d). Regarding the luminance decline during the continuous lighting in the atmosphere of 70°C and 60°C/90-95%RH, resultant data were substantially identical with those of the first embodiment.

Two comparative examples e) and g) caused no light emission. Another comparative example f) caused a small amount of light emission in the vicinity of collecting electrode 5a.

The conductive power of the transparent electrode paste, used in a third example, was a mixture of needle-like stannic indium oxide (SCP-SX of Sumitomo Metal Mining Co., Ltd.) and fine-grain stannic indium oxide (UFP-X of Sumitomo Metal Mining Co., Ltd.). And, its blending ratio was changed variously. Furthermore, the blending ratio of all the conductive powder to the insulating resin was also changed. Numerous EL lighting elements were fabricated by combining these two parameters in matrix. Then, luminance value, irregularities of luminance, and resistance value of the transparent electrode of each finished product of the fabricated EL lighting element were measured. Table 1 shows the result of the measurements.

TABLE 1

wt%	0	10	20	30	40	50	60	70	80	100
30%										
kΩ	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞
Cd/m^2	0	0	0	0	0	0	0	0	0	0
40%										
kΩ	∞	∞	∞	∞	∞	∞	∞	∞	∞	14
Cd/m^2	0	0	0	0	0	0	0	0	0	69
50%										
kΩ	∞	∞	∞	∞	∞	∞	∞	∞	12	.76
Cd/m^2	0	0	0	0	0	0	0	0	72	75
60%										
kΩ	∞	∞	∞	∞	∞	∞	3000	4.8	.54	.15
Cd/m^2	0	0	0	0	0	0	21	74	75	74
70%										
kΩ	∞	∞	∞	860	25	8.5	2.1	.52	.22	.12
Cd/m^2	0	0	0	36	66	69	73	73	71	68
80%										
kΩ	3500	4700	210	10	4.6	1.5	.41	.18	.12	.11
Cd/m^2	13	12	51	72	74	72	69	69	67	63
90%										
kΩ	250	125	6.8	1.8	.32	.18	.14	.12	.11	-
Cd/m^2	48	49	55	68	69	66	66	66	65	-
95%										
kΩ	∞	∞	∞	126	75	-	-	-	-	-
Cd/m^2	0	0	0	56	57	-	-	-	-	-
96%										
kΩ	∞	∞	∞	220	-	-	-	-	-	-
Cd/m^2	0	0	0	23	-	-	-	-	-	-

In the table 1, 0 to 100 wt% represents the ratio of the needle-like powder to all the conductive powder, while 30 to 96 % represents the blending ratio of all the conductive powder to the insulating resin. Infinity (∞) represents a resistance value larger than 10MΩ, and "-" represents the experimental result that no paste was obtained and therefore no printing operation was performed. The luminance value is expressed in terms of Cd/m^2, and the resistance value is expressed in terms of kΩ. When each of the above-described samples includes needle-like conductive powder not larger than 10%, its luminance value was greatly lowered or reduced to zero by leaving this sample in the atmosphere of 40°C/90-95%RH.

In a fourth example, a thermocompression bonding terminal 9, provided at the distal end of collecting electrodes 5a and 5b of the EL lighting element of the first example, was connected to a printed circuit board 10 by using anisotropic conductive adhesive (CP7131 of Sony Chemical Co., Ltd.) under thermocompression bonding conditions of 180°C, 35kg/cm^2 and 30sec. Fig. 3 shows a connected condition of thermocompression bonding terminal 9 and printed circuit board 10. A driving inverter circuit is mounted on printed circuit board 10 to activate or turn on a light-emitting section 7. Light-emitting condition was not at all changed by bending a wiring harness 8 of the collecting electrodes in

any way.

In a fifth example, a reinforcement board 11, which is PET film of 188μm with adhesive on its surface is bonded on the reverse surface of collecting electrodes 5a and 5b of the EL lighting element of the first embodiment, to fabricate an EL lighting element capable of connecting a film connector. Fig. 4 is a partly cross-sectional view showing each layer of the fifth example EL lighting element.

In a sixth example, the arrangement of collecting electrodes 5a and 5b, back-surface electrode layer 5 and insulating coat layer 6 are modified in the following manner.

Collecting electrodes 5a and 5b: conductive paste (DW-250H of Toyobo Co., Ltd.) having a dry film thickness of 10μm.

Back-surface electrode layer 5: conductive paste (DY-150H of Toyobo Co., Ltd.) having a dry film thickness of 8μm.

Insulating coat layer 6: insulating paste (TSE3221 of Toshiba Silicon Co., Ltd.) having a dry film thickness of 25μm.

By performing the lamination printing operation of these layers, an EL lighting element having a cross section shown in Fig. 5 is fabricated. Collecting electrodes 5a and 5b are silver resin group paste, while back-surface electrode layer 5 is carbon resin group paste.

When electric voltage 100V of 400Hz was applied to the EL lighting element of the sixth example, a resultant initial luminance was 72.3 Cd/cm^2.

As explained in the foregoing description of the first to sixth embodiments, the EL lighting element of the present invention does not cause a deterioration of the conductivity of the transparent electrode layer even if the light-emitting layer and the dielectric layer are pattern printed in the piled-up manner on the transparent electrode layer. In other words, all of layers including the transparent electrode layer can be formed by (screen) printing. Hence, the production cost is cheap and electrical connection of the collecting electrodes can be easily done.

Furthermore, a flexible printed circuit board (FPC) is generally known as having a circuit wiring pattern printed by conductive paste on an insulating transparent film such as PET. The present invention makes it possible to form an EL lighting element at a desired portion on the FPC by pattern printing, bringing large merits in various industries.

Hereinafter, a first embodiment of the present invention relating to an illuminated switch unit using the electroluminescent lighting element described in the above first to sixth examples will be explained with reference to the accompanying drawings.

As shown in Fig. 6, an EL lighting element 15 having a reverse surface provided with a switch operating projection 14 is disposed on a membrane switch 13 via spacer 16 which is an adhesive sheet made of resin film having a thickness of approximately 200μm and having both surfaces applied adhesive thereon.

An arrangement of membrane switch 13 will be explained in more detail, hereinafter. A lower insulating sheet 17, made of resin film having a thickness of approximately 100μm, has an upper surface on which a lower stationary contact 18 is formed by printing using a silver resin group or carbon resin group paste. Then, a lower insulating spacer 19 is formed on the lower insulating sheet 17 so as to cover a region other than this lower stationary contact 18 by using semi-transparent vinyl acetate = vinyl chloride group insulating paste, thereby exposing this lower stationary contact 18. An upper movable contact 21 is printed on a reverse (lower) surface of an upper insulating sheet 20, made of resin film having a thickness of approximately 100μm, by using a silver resin group or carbon resin group paste, in such a manner that upper movable contact 21 is disposed in confronting relationship with lower stationary contact 18. An upper insulating spacer 22 is formed around this upper movable contact 21 using semi-transparent insulating paste so as to expose this movable contact 21. Thus, when lower insulating sheet 17 and upper insulating sheet 20 are disposed in position, lower stationary contact 18 and upper movable contact 21 are brought into a confronting relationship with a predetermined gap therebetween. Lower insulating spacer 19 and upper insulating spacer 22 are fixed with each other by applying pressure and heat.

Next, EL lighting element 15 will be explained in more detail with reference to Fig. 7. A base sheet 23, made of insulating transparent film having a thickness of 100μm, has a reverse (lower) surface on which a transparent electrode layer 24 is printed by using a transparent electrode paste. This transparent electrode paste contains indium oxide power added and diffused into insulating resin. A light-emitting layer 25 is printed on a lower surface of this transparent electrode layer 24 by using a paste containing zinc sulfide phosphor powder stirred and diffused into binder resin. A dielectric layer 26 is printed on a lower surface of this light-emitting layer 25 by using a paste containing barium titanate powder stirred and diffused into binder resin. Still further, a back-surface electrode layer 27 is printed on a lower surface of this dielectric layer 26 by using a carbon resin group paste. Finally, an insulating coat layer 28 is printed on a lower surface of this back-surface electrode layer 27 by using an insulating paste.

A switch operating projection 14 is printed by using an epoxy group resin at a predetermined position on a lower surface of insulating coat layer 28, so that this switch operating projection 14 can be positioned concentrically with lower stationary contact 18 and upper movable contact 21 of membrane switch 13 when EL lighting element 15 is placed on membrane switch 13 by keeping back-surface electrode layer 28 at bottom.

Provided on an upper surface of EL lighting element 15 are printed patterns 48 representing letters, figures or others.

Next, an operation of the above-described illuminated switch unit of the present embodiment will be explained.

When EL lighting element 15 is depressed downward, switch operating projection 14 moves downward and pushes upper movable contact 21 of membrane switch 13 so that upper movable contact 21 can be brought into contact and electrically connected with lower stationary contact 18 of membrane switch 13.

With the above-described arrangement, it becomes possible to remove any obstacles interrupting or intercepting illumination light emitted from EL lighting element 15. Hence, uniformity of illumination light emitted from EL lighting element 15 can be surely obtained. Furthermore, the construction of the illuminated switch unit becomes simple and suitable for mass-production and, hence, the manufacturing costs of the same can be reduced largely.

Hereinafter, a second embodiment of the present invention will be explained.

As shown in Fig. 8, the second embodiment is different from the first embodiment in that a movable contact 29 is provided on a lower surface of a diaphragm 30 configured or squeezed into a dome shape by thermally molding upper insulating sheet 20 of membrane switch 13.

With this arrangement, it becomes possible to obtain a crisp and better click feeling in the operation of the switch, in addition to the effects obtained from the above-described first embodiment.

Hereinafter, a third embodiment of the present invention will be explained.

As shown in Fig. 9, the third embodiment is different from the second embodiment in the arrangement of the membrane switch.

More specifically, an membrane switch 31 of this embodiment comprises a horseshoe-like stationary contact 33 which is a conductive pattern formed on a lower insulating substrate 32, a circular stationary contact 34 provided closely inside the horseshoe-like stationary contact 33, a saucer-like diaphragm 35 which is made of a metallic member having sufficient resilience such as phosphor spring or stainless steel, and an adhesive tape 36 which is a resin film having a surface applied with adhesive for bonding diaphragm 35 to stationary contact 33. EL lighting element 15 is fixedly provided above this membrane switch 31 through a spacer 37 which is an adhesive sheet made of resin film having a thickness of approximately 200μm and having both surfaces applied adhesive thereon.

With this arrangement, it becomes possible to obtain a further crisp and better click feeling in the operation of the switch and realize a thin configuration of the switch, in addition to the effects obtained from the above described second embodiment.

Hereinafter, a fourth embodiment of the present invention will be explained.

As shown in Fig. 10, the fourth embodiment is similar to the first to third embodiments but different in that a switch operating projection 38 comprises a button 39 fixed on the lower surface of insulating coating layer 28 of EL lighting element 15 by using adhesive 40. Button 40 is formed by punching a high heat-resistant film such as polyether sulfone (PES).

Alternatively, button 39 can be a resin mold product having sufficient rigidity or a metallic sheet, or the like.

With this arrangement, it becomes possible to provide a push switch having a long stroke unattainable by the switch operating projection 14 formed by printing, in addition to the effects of the above-described first to third embodiments.

As apparent from the foregoing description of the first to fourth embodiments, the present invention forms the switch operating projection on the back-surface side of the EL lighting element and disposed this EL lighting element above the push switch. Hence, it becomes possible to remove any obstacles interrupting or intercepting illumination light emitted from the EL lighting element. Hence, uniformity of EL lighting element illumination can be surely obtained. Furthermore, the construction of the illuminated switch unit becomes so simple that a large number of parts and assembling processes can be eliminated. Accordingly, it becomes possible to provide a cheaper illuminated switch unit, bringing great utilities and merits in various industries.

Claims

1. An illuminated switch unit comprising:

    a push switch (13) having a movable contact (21) and a stationary contact (18) disposed in a confronting relationship with a predetermined gap; and
    an electroluminescent lighting element (15) provided above said push switch (13), said electroluminescent lighting element (15) having a reverse surface provided with a push-switch operating projection (14) for depressing said movable contact (21) to turn on said push switch (13).

2. An illuminated switch unit according to claim 1, wherein said push-switch operating projection (14) is formed by printing insulating resin.

3. An illuminated switch unit according to claim 1, wherein said push-switch operating projection (14) is formed by bonding a rigid member (39).

4. An illuminated switch unit according to any one of claims 1 to 3, wherein said electroluminescent lighting element

(15) is a diffusion-type electroluminescent lighting element.

5. An illuminated switch unit according to any one of claims 1 to 4, wherein a surface of said electroluminescent lighting element (15), serving as a light-emitting surface, is provided with printed patterns (48) representing letters, figures or others.

6. An illuminated switch unit according to any one of claims 1 to 5, wherein said push switch (13) is a membrane switch with or without click motion.

7. An illuminated switch unit according to any one of claims 1 to 5, wherein said push switch (13) is a push switch with click motion, and said movable contact (21) is a metallic thin plate (35) configured in a diaphragm shape.

FIG. 1

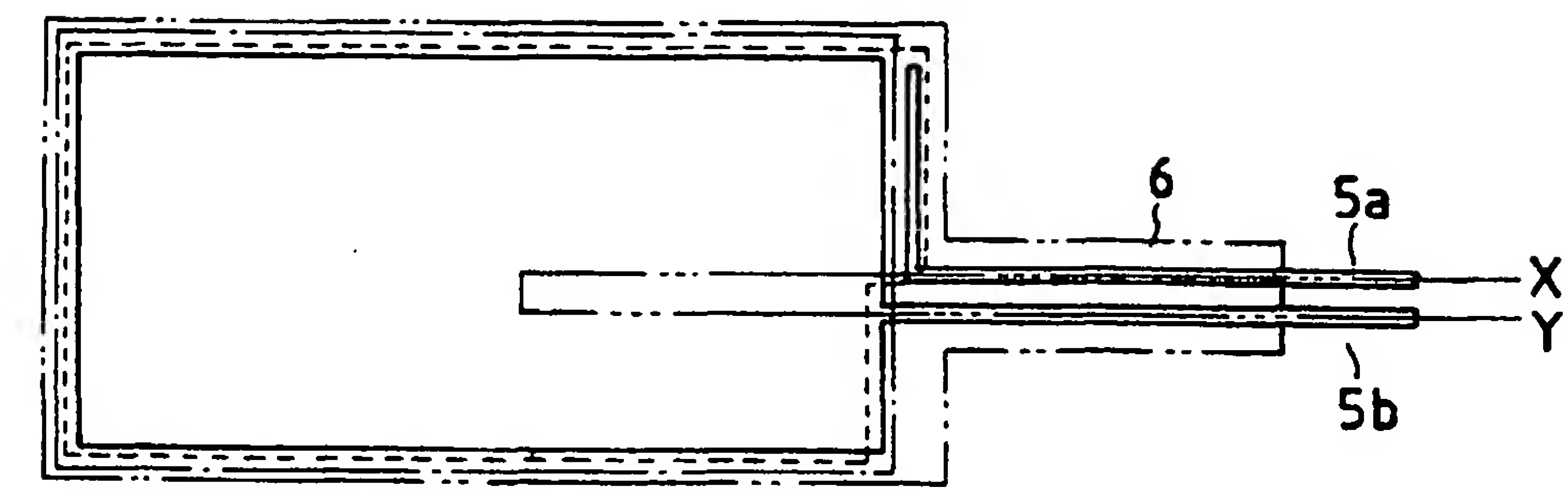


FIG. 2

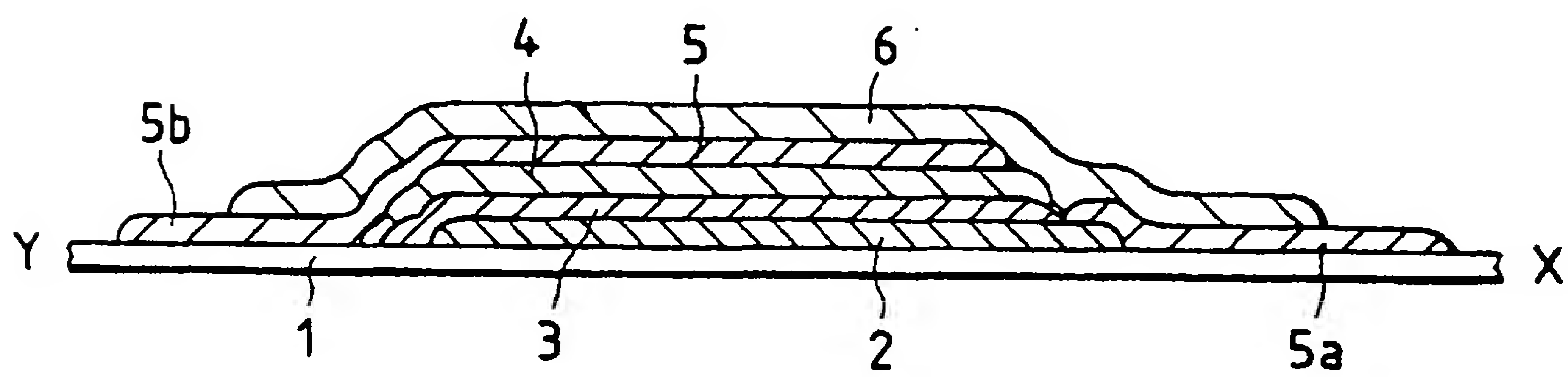


FIG. 3

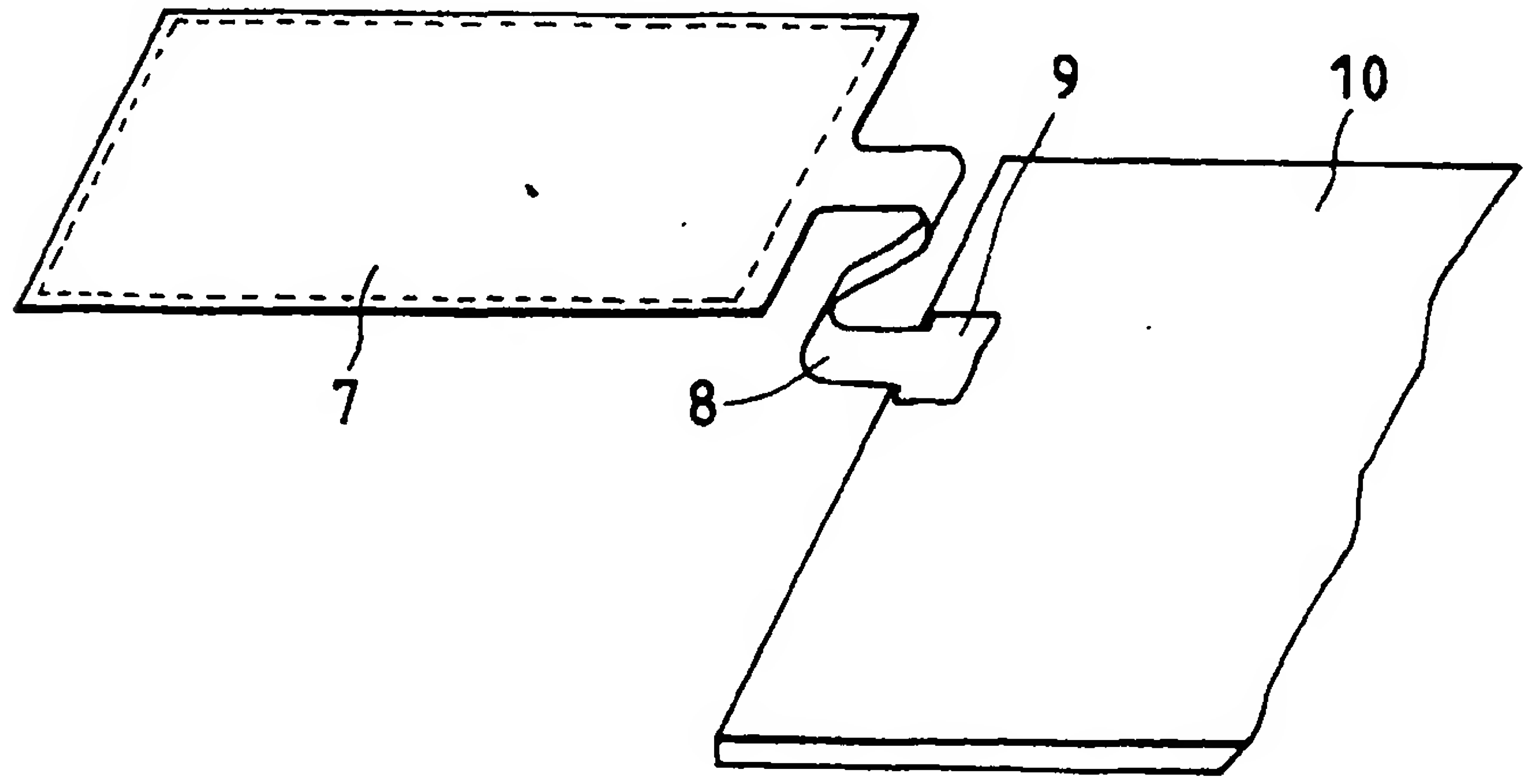


FIG. 4

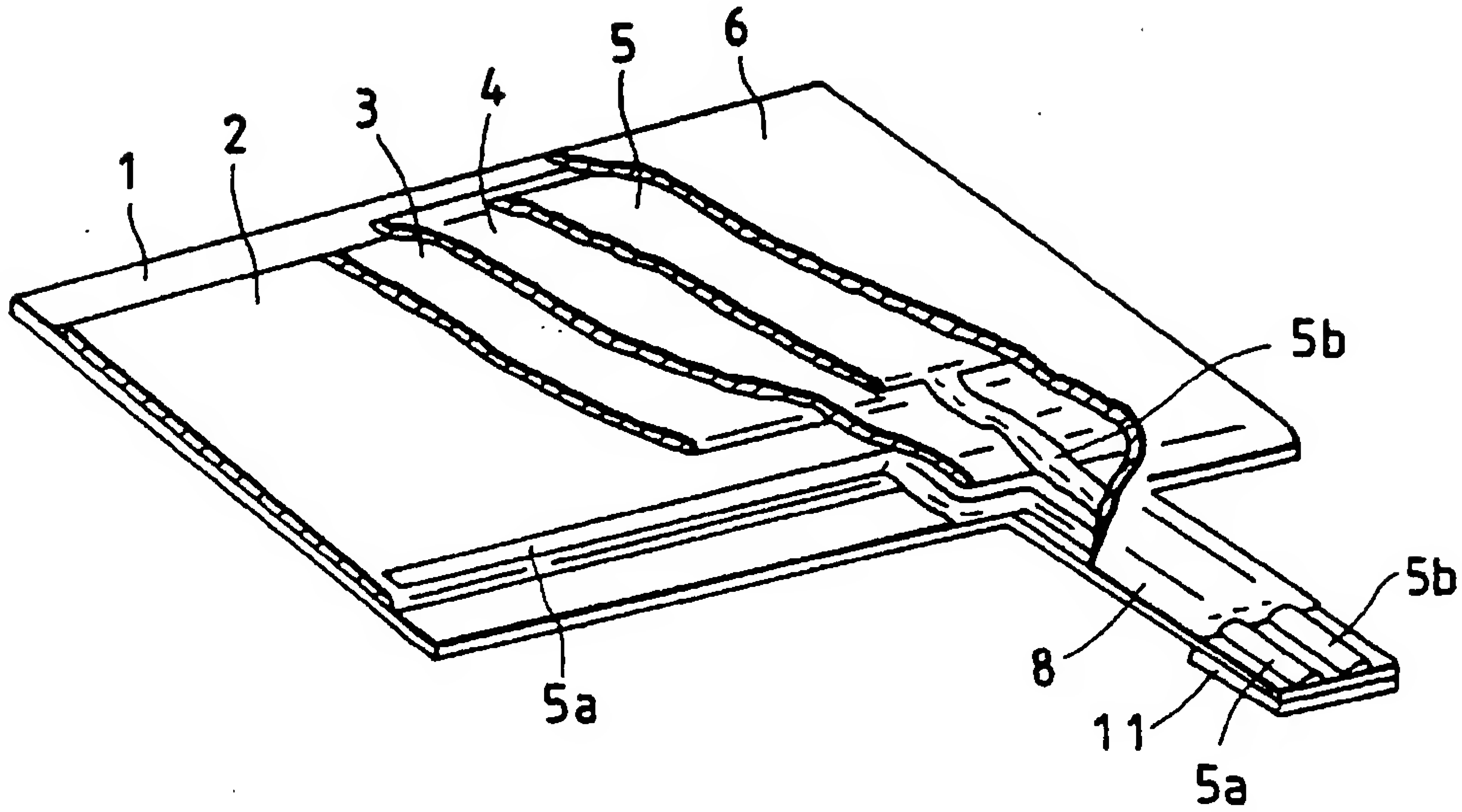


FIG. 5

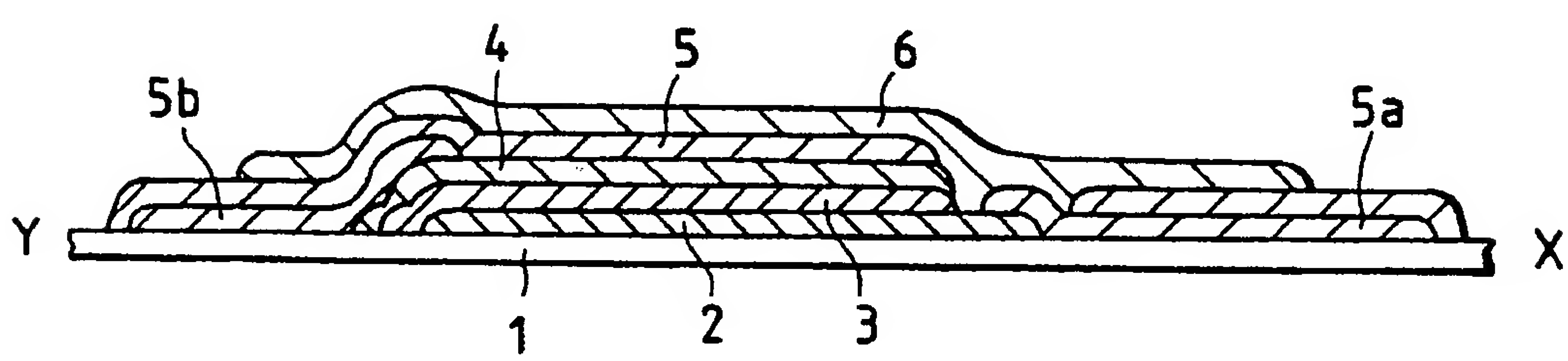


FIG. 6

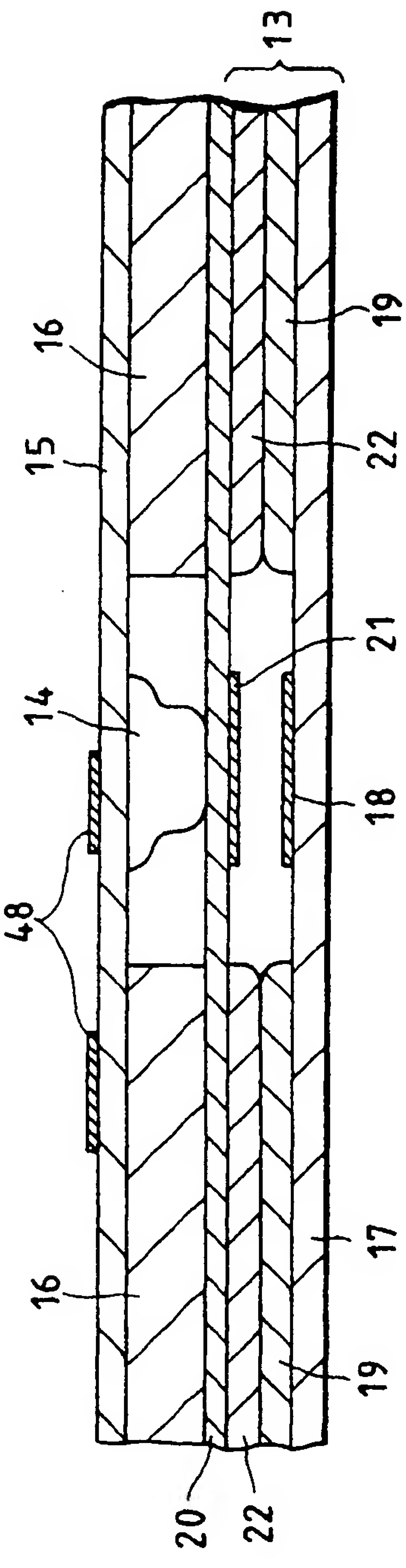
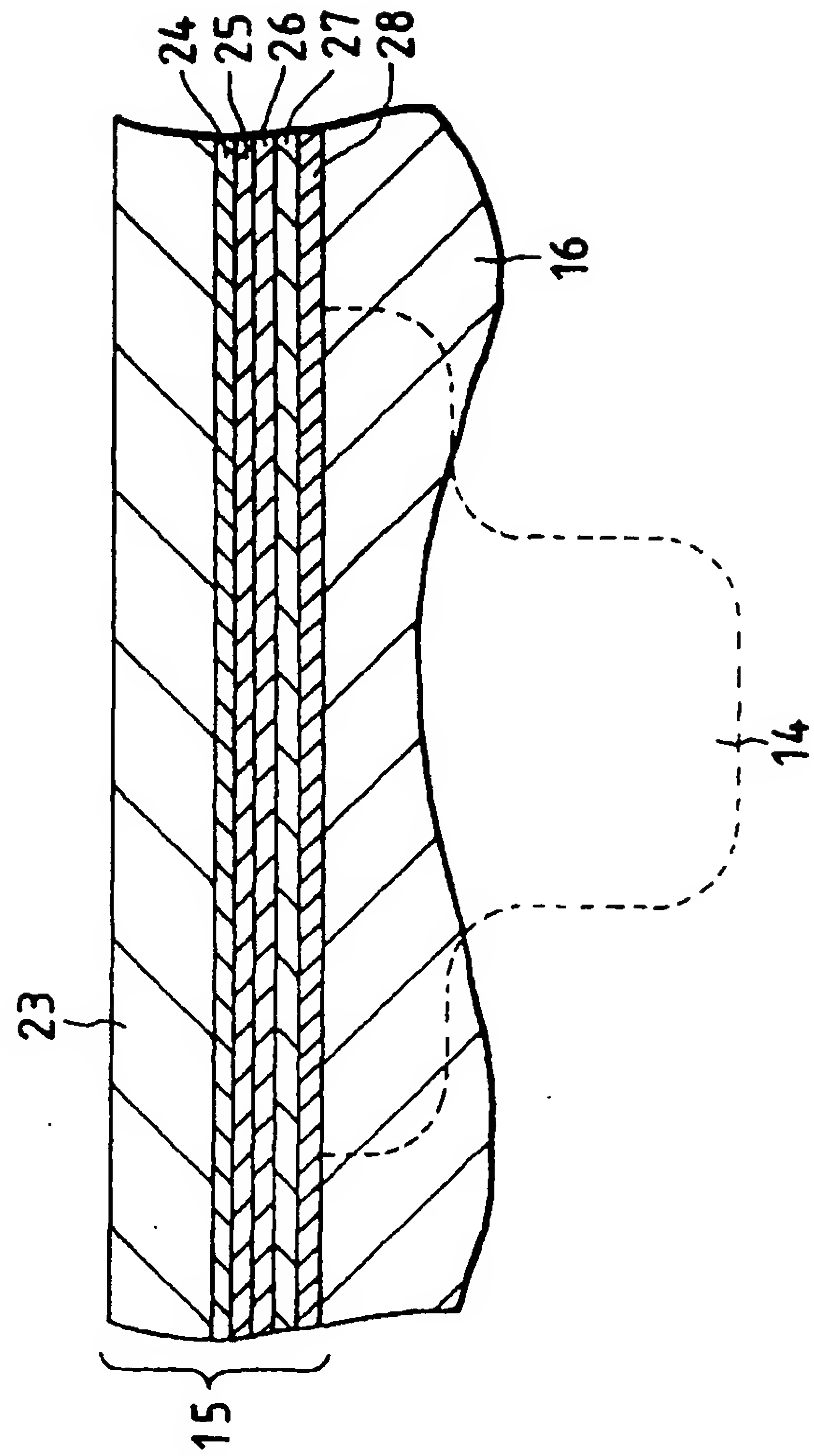


FIG. 7



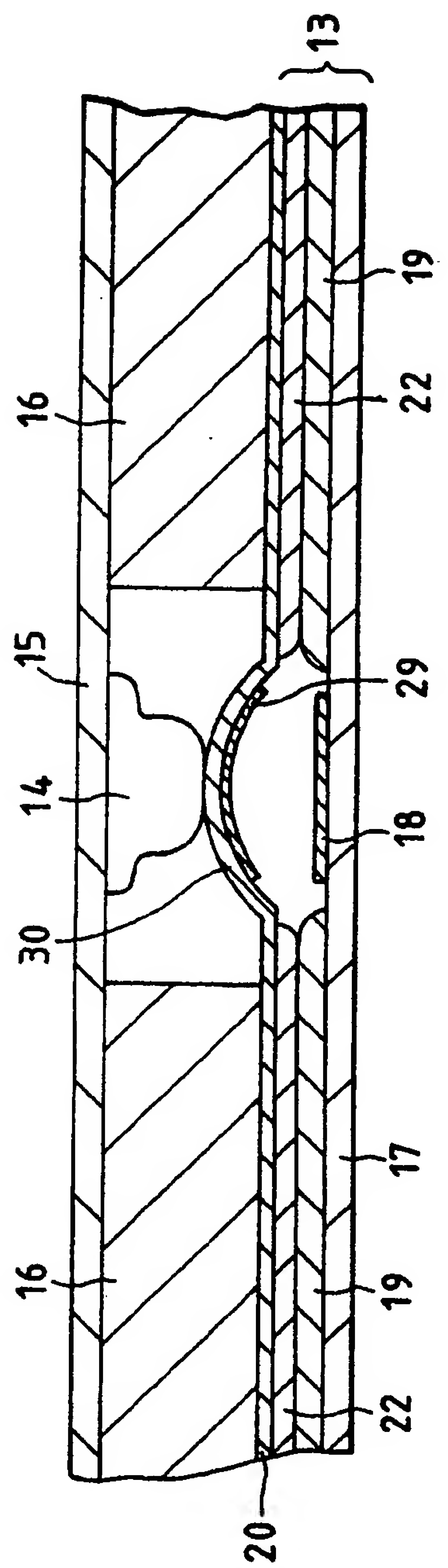

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FIG. 8

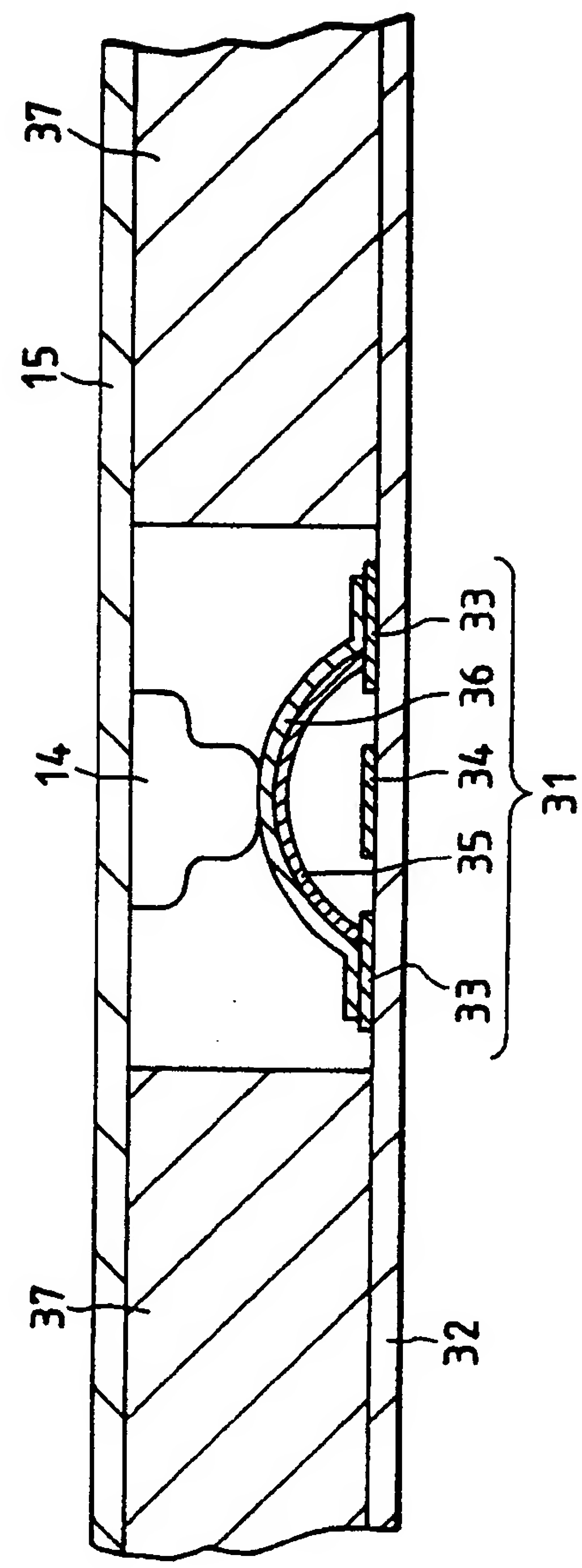
37
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FIG. 9

FIG. 10

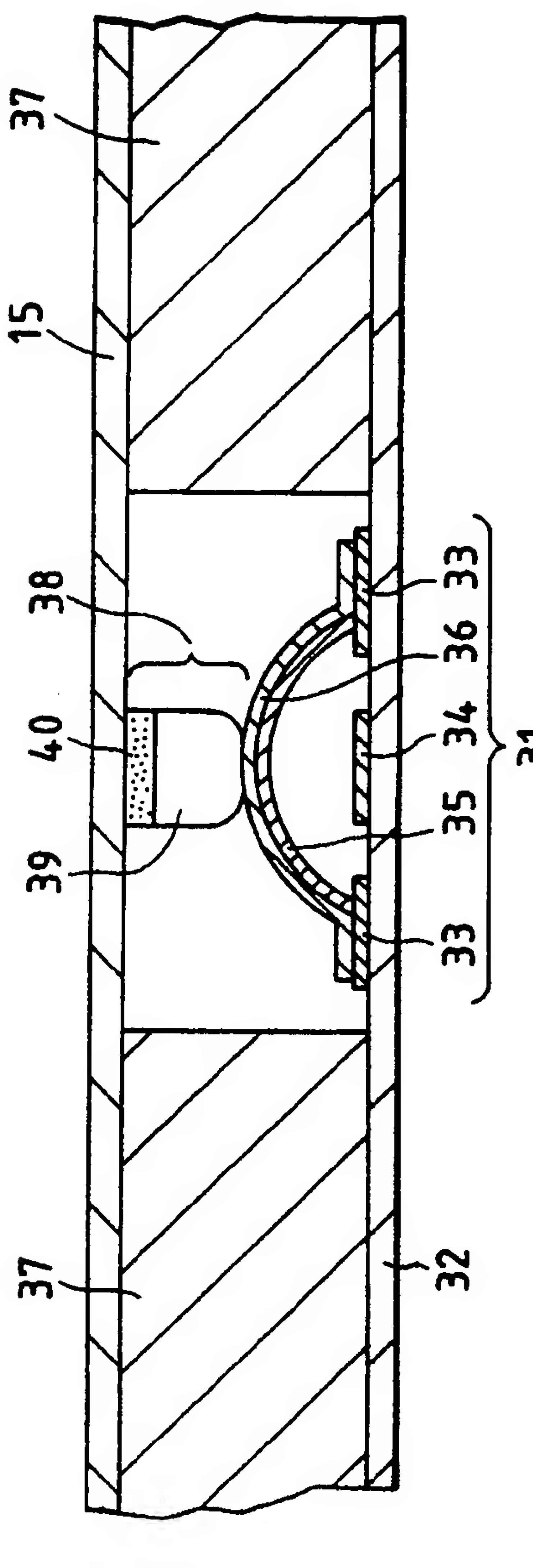

FIG. 11 PRIOR ART